BOT 401: GENETICS, PLANT BREEDING AND EVOLUTION

UNIT I

A brief history, scope and significance of genetics.
Mendel's law of inheritance.
Lethality and Interaction of genes.
Quantitative inheritance: polygenic inheritance.
Nature and concept of chemical basis of heredity.

UNIT II

Multiple alleles.
Self sterility.
Linkage and its measurement.
Crossing over: theories of crossing over.
Mapping of genes on chromosomes.

UNIT III

Genetic recombination in bacteria: conjugation, transformation and transduction.
Cytoplasmic inheritance.
Mutations : types, methods of artificial induction, method of detection of mutants.
Biochemical genetics of *Neurospora.*

UNIT IV

Origin of life.
Mutation and evolution.
Genetics and evolution.
Genetic drift.
Speciation.

UNIT V

Method of plant breeding, plant introduction, mass, pure line and clonal selection.
Aims and objectives of hybridization types: inter specific and intergeneric; back crossing.
Grafts hybrids, chimeras and bud spot.
Heterosis: theories and applications with reference to maize.
Plant breeding work done in India with reference to wheat and rice.

PRACTICAL 401:

1. Determination of probability of tossing for one coin.
2. Determination of probability for the throw of dice.
3. Determination of probability for tossing of two coins.
4. X^2 test as applied to the result of above three experiments.
5. Determination of size of the leaves on a specific size of two population of a species and calculation of standard deviation and standard error.
6. Permutation and combination.
7. Correlation analysis.
8. Determination of genotype from the data provided.
9. Determination of linkage values from the data provided and preparation of chromosome map.
10. Determination of various mendelian ratio by cheker board as well as by binomial equation.
11. Study of gene frequency in the populations.
12. Use of Anderson's scatter diagrams in the differentiation of the genetic population.
13. Emasculation of flower.
14. The working of the instruments used in various experiments must also explained./ At least 60% of the above mentioned exercises be performed and must be handed over to the external examiner who will select out the exercise to be distributed among at the time examination.

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BOT 402: PLANT BIOTECHNOLOGY:IN VITRO CULTURE, GENETIC ENGINEERING AND IPR ISSUE

UNIT I

Concept and scope of Biotechnology.
Techniques of tissue culture, cell culture and organ culture.
Sterilization ,culture media.
In vitro auxotrophs, disease resistance, salt and drought resistance, nutritional quality and herbicide resistance.

UNIT II

Micropropagation.
Production of haploids: anther culture and pollen culture
Somatic embryogenesis, somaclonal variation.
Protoplast culture: isolation, culture and fusion of protoplast.
IPR-general idea about patents. Copyright, trademark and geographical indication.

UNIT III

Biotransformation: production of useful compounds through cell culture; factors affecting yield: bioreactors.
Strategies of microbial strain improvement.
The recombinant DNA concept and principle of cloning.
Isolation and purification of DNA.

UNIT IV

Restriction endonuclease : properties and types.
Blotting southern, northern and western
Selection and screening of recombinant clone.
Cloning vehicles salient features: plasmid , cosmid & Tiplasmid.

UNIT V

Single stranded DNA viruses CaMV Lambda phage vectors M13 vectors.
Expression vectors.
Cloning construction of genomic and DNA libraries
Application of r- DNA technology in plant improvement.

PRACTICAL 402:

1. Selection of salt tolerance / amino acid analogue resistance through cell culture.
2. Isolation and culture of protoplast.
3. Isolation and screening of industrially important microorganism.
4. Isolation of plant DNA, plasmid DNA, bacteriophage DNA.
5. Genetics colonization and tumour induction Agrobacterium Tiplasmid.
6. Restriction analysis and molecular weight DNA.
7. Sequencing and polymerase Chain Reaction.

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ELECTIVE PAPERS (OPTIONAL)

BOT E01: INDUSTRIAL MICROBIOLOGY

UNIT I

Development and scope of Industrial Microbiology. Use of Fermentation equipments: Design and construction of fermenters, Batch and Continuous fermenters. Computer control of fermentation process. Characteristics of fermentation media, Raw materials (substrates).

UNIT II

Use of microorganisms in industries through ages.
Strategies for isolation and screening of industrially important microorganism.
Strategies for improvement of industrially important microbial strains.

UNIT III

Industrial product of vinegar.
Industrial product of citric acid.
Industrial product of antibiotics; penicillin and streptomycin.
Industrial product of amino acids; glutamic acid and lysine.

UNIT IV

Microbes as a source of Single Cell protein (SCP).
Mushrooms and food value of mushrooms.
Dairy product from microorganisms; butter, yogurt and cheese.
Hygine and safety in fermentation industries.

UNIT V

Biopesticides: bacterial, fungal and viral control of insect pests.
Biofertilizer: production and method of application.
Bioremediation.

PRACTICALS E01:

1. Isolation and identification of bacteria, yeast and fungi from bakeries and fermenters of distilleries.
2. Inoculation of fungi and bacteria on sterilized glucose and sucrose solutions and identification of the different types of amino acids and organic acids in filterate during different incubation periods. (Chromatography)
3. Isolation and identification of different types of fungi and bacteria from curd, rotten fruits and vegetables.
4. Collection of different types of mushrooms from local area/ region; inventory and analysis of their amino acid contents. (Chromatography)
5. Preparation of spawn for cultivation of edible mushrooms.
6. Observation of the antagonism of three antibiotics against common plant pathogens in Petri plates (disc methods).

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BOT E03: ETHNOBOTANY AND ISOLATION OF NATURAL PRODUCTS

UNIT I

Ethnobotany, its scope, interdisciplinary approaches.
Ethnic groups of India : major and minor tribes, life styles of ethnic tribes, conservation practices of biodiversity, taboos and totems.
World centers of Ethnobotany with special reference to India.

UNIT II

Role of Ethnobotany in national priorities, health care and development of cottage industries in India.
History and principles of ayurveda, Homeopathy, Allopathy, Unani and Siddha system of medicines.
A general idea of active principles of plants and plant parts their extraction and preparation of medicines in different systems.

UNIT III

Scope and uses of essential oil from plants as perfumes, cosmetics and as flavoring agents.
Preparation of perfumes from aromatic plants with special reference to the following Lemon grass, Palmrosa, Mint, Lavender, Rose, Eucalyptus and Vetiver.

UNIT IV

Plants used in medicine with special reference to following.
Adhatoda vasica, Asparagus racemosus, Hollarhina antidysenterica, Tinospora cordifolia
Terminalia arjuna, Terminalia bellerica, Terminalia chebula, Pterocarpus marsupium, Commiphora wightii.
Regional relevance and credibility of medicinal plants used by tribals of M. P.

UNIT V

Plants used in medicine with special reference to following.
Argemone mexicana, Boerhaavia diffusa, Eclipta prostrata, Psoralia coralifolia, Withania sominifera, Tylophora indica, Rauwolfia serpentina, Dioscorea deltoids.
Plants used in scarcity, emergency and as supplementary foods by tribals of India.

PRACTICAL E03:

1. Visit to tribal area and study of plant material used tribals.
2. Identification and description of important plants of ethno botanical importance.
3. Identification of important aromatic plants of the locality.
4. Extraction of active ingredients of plant and plant parts.
5. Extraction of perfumes of aromatic plants.
6. Pharmacognostic method of identification of drugs.
7. Methods of preparation of Kwath, Churra, Ark, Saiva Asav.
8. Diseases of some common medicinal plant of the locality.
9. Identification and description of 10 plants used by tribal for household purpose.